

HW1

1. 지형자료, lognormal 분포

2. 다중경로 (or Reflection, Diffraction, Scattering),  
Rayleigh 분포 (No LOS) / Rician 분포 (Yes LOS)

3.  $f_c \uparrow$ , 안테나 이득 증가, 경로 손실 증가

6.  $f_{\max} = \frac{v}{c} f_c \cos \theta$

i)  $f_{\max} = \frac{\frac{1 \times 10^5}{3600}}{3 \times 10^8} \times 1 \times 10^9 \times \cos 0^\circ \approx 92.6 \text{ Hz}$

$$f_R = f_c + f_{\max} = 1,000,000,093 \text{ Hz}$$

ii)  $f_{\max} = \frac{\frac{1 \times 10^5}{3600}}{3 \times 10^8} \times 1 \times 10^9 \times \cos 120^\circ \approx -46.3 \text{ Hz}$

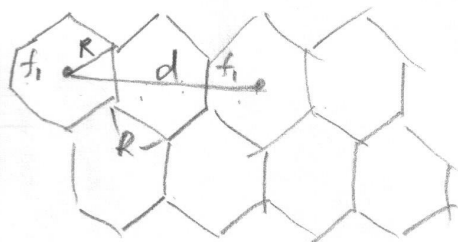
$$f_R = 999,999,954 \text{ Hz}$$

7. i)  $10 \log_{10} \frac{P_t}{P_r} = 60 \text{ [dB]} \Rightarrow P_r = \frac{P_t}{10^6} = 100 \times 10^{-3} \times 10^{-6}$   
 $P_r = 100 \text{ nW, or } 0.1 \text{ mW}$

ii)  $P_r = \frac{P_t}{10^{10}} = 100 \times 10^{-3} \times 10^{-10} = 1 \times 10^{-11}$   
 $P_r = 0.01 \text{ nW}$

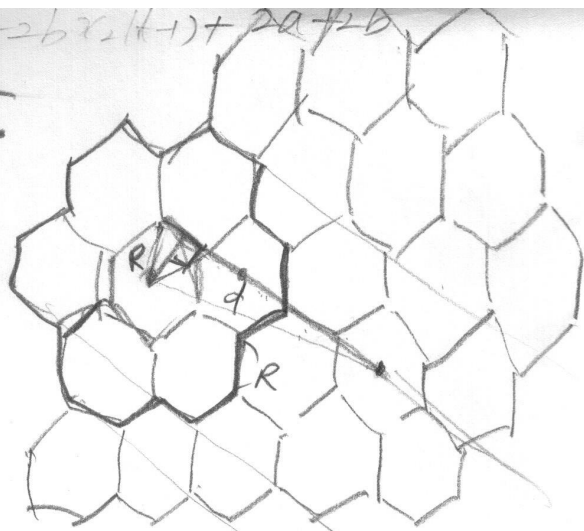
$$ay_1 + by_2 = 2a x_1(t+1) + 2b x_2(t+1) + 2a + 2b$$

4.



$$D = \frac{\sqrt{3}}{2} R \times 4 = 2\sqrt{3} R.$$

5.



$$d = \sqrt{(4.5R)^2 + \left(\frac{\sqrt{3}}{2}R\right)^2}$$

$$= R \sqrt{\frac{81+3}{4}}$$

$$= R \sqrt{21} = R \sqrt{7 \times 3}$$

8. ii)  $\alpha = 2$ .  $L_p \propto d^2 \rightarrow L_p = k d^2$ . ( $k: \text{비례상수}$ )

$$L_{p_0} = k d_0^2, \quad L_{p_1} = k (2d_0)^2$$

$$\frac{L_{p_1}}{L_{p_0}} = 4\text{배} \rightarrow 6\text{dB 증가}$$

ii)  $\alpha = 5$ .

$$\frac{L_{p_1}}{L_{p_0}} = 2^5 = 32\text{배} \rightarrow 15\text{dB 증가}$$

9.  $R_{\max} \leq \frac{1}{2T}$     i)  $5\text{kHz}$ ,    ii)  $500\text{Hz}$

10.  $P_0 = \left[ \sum_{i=0}^S \frac{a^i}{i!} \right]_{a=1, S=5}^{-1} = \frac{1}{2.718}$

$$P_B = \frac{a^i}{S!} P(0) \Big|_{a=1, S=5} \approx 3.07 \times 10^{-3} \text{ (블록킹 확률)}$$

$$\text{Efficiency} = \frac{1 \times (1 - 3 \times 10^{-3})}{5} = 19.94\% \text{ (효율)}$$